REMARKS

Careful consideration has been given by the applicant to the Examiner's comments and rejection of the claims, as set forth in the outstanding Office Action, and favorable reconsideration and allowance of the application, as amended, is earnestly solicited.

Applicant notes the Examiner's minor objection to the disclosure, and appropriate amendment has been implemented to remove reference to Claim 1 on Page 2 of the disclosure, thereby rendering moot this particular objection.

Furthermore, applicant notes that Claims 1-12 have been rejected under 35 U.S.C. §102(b) as being anticipated by Jeffrey, U.S. Patent No. 2,331,694, as extensively detailed in the Office Action.

However, concerning the cited reference to Jeffrey, applicant notes that the identical publication was cited in an International Preliminary Examination Report in the corresponding PCT application, of which the present U.S. case is the national stage, and wherein the Examiner indicated that reference is made in the Jeffrey publication to a single helical compression spring that is considered to be analogous to the present helical compression spring.

However, applicant respectfully takes issue with that supposition, since although the use of single springs may be generally known; it is the novel configuration of the present reducing diameter single spring construction installed in the cylinder bore of a piston, which provides for the unique functional advantages that are not at all known in the technology.

Reverting to the cited prior art, and particularly the advantages thereover attained by the present invention, applicant notes that the present construction of an axial piston machine with a resetting force mechanism for the hollow pistons in a cylinder drum, in order to avoid friction between the resetting assembly and the internal piston wall, which is generated as a result of the buckling or outward bulging of helical coil springs, is obtained in a manner that is of a simpler construction and

resultingly less expensive than in the prior art. Hereby, pursuant to the present invention, each piston cylinder bore contains only a single helical compression spring which is adequate for providing the resetting force, but in order to concurrently avoid any undue friction encountered in contacts between the spring and the internal wall of the hollow piston, the spring is configured so as to have a reduced diameter between the ends thereof, i.e., at locations which experience to greatest extend of outward bulging or buckling.

In essence, the present spring 23, as clearly illustrated in the drawing figure, shows it to be concavely configured between the opposite ends thereof, whereby any outward bulging of the spring during operation will avoid or at least considerably ameliorate any friction forces encountered between the spring and the surrounding inner wall of the hollow piston during compression, and also responsive to rotational forces acting on the piston cylinder drum.

The foregoing structure and function is not at all ascertainable from the cited prior art, as represented by Jeffrey, in traverse of which applicant submits as follows:

To the contrary, although Jeffrey briefly mentions on Page 3, Column 1, Lines 3-6 that two springs are utilized in lieu of a single spring, the single spring mentioned therein is clearly directed to the usual constant diameter cylindrical construction of a helical compression spring, which does not in any manner contemplate the configuration thereof possessing a reduced diameter center potion extending between the opposite ends of the spring.

Thus, in order to meet the requirements of the structure in Jeffrey, the latter provides for two conically tapered helical compression springs, wherein the narrower ends face towards each other, and are contained in annular seats of a sleeve-shaped member or crosshead 55, which is freely displaceable within a hollow piston, as indicated on Page 2, right hand column, Lines 41-43 of Jeffrey, and is able to slide or rotate therein. The aspect that the springs conically reduce or taper

towards one end facing each other appears to be only required in that the narrower end of each conical spring is to be received in the sleeve-like member 55, the internal diameter of which is smaller than the diameter of the hollow piston.

The foregoing configuration in Jeffrey provides for an extremely complex construction requiring at least three separate components arranged within each single hollow piston, in effect, two helical springs 34 and 35, the narrower ends of which are restrained within the sleeve member 55 also contained within the hollow piston so as to be slideable therein during reciprocation and rotation of the piston.

Consequently, the structure of the tapered set of springs is not analogous to a single helical compression spring having a reduced diameter center portion intermediate the ends of the spring, and wherein the use of a single spring of that novel configuration clearly provides for an advantage in that compression of the helical compression spring has the friction encountered with the inner wall of the piston due to rotation and/or buckling or bulging clearly reduced or even eliminated in view of the reduced diameter thereof intermediate the opposite ends of the single helical compression spring.

Moreover, in each piston bore, it is only necessary to provide a single spring member, rather than two springs and a sleeve-like element 55, which is positioned between two tapered or conical springs and captures the narrower ends thereof, which pursuant to Hook's Law, imparts a preferred spring rate to the use of one spring compared to two series-coupled springs.

Moreover, a further advantage of the present spring construction resides in that any centrifugal forces caused by the rotation of the cylinder drum which tend to press the spring coils radially outwardly against the inner wall of the hollow piston thereby causing friction therebetween, provides for a reduced amount of friction since a greater amount of space or clearance is originally present between the reduced diameter portions along the extent of the spring and the inner wall of the piston.

To the contrary, the conical springs in Jeffrey are more closely positioned towards the inner wall of the piston and would have a tendency to be pressed against the inner wall of the piston during rotation of the cylinder drum. Hereby, in Jeffrey, the outer diameter of the sleeve 55 is larger than the minimum outer diameter in the center portion of the present single spring, whereby the sleeve in Jeffrey would have a tendency to generate frictional forces, all of which forces are eliminated or greatly ameliorated by the concave or reduced diameter center portion of the single helical compression spring pursuant to the present invention.

Accordingly, in order to clearly and unambiguously patentably distinguish over the art represented by Jeffrey, applicant has amended the claims in order to emphasize, having particular reference to the amended independent Claim 1, that the spring is a helical compression spring, where a single such spring is arranged within each respective hollow piston, and wherein at least the center portion of the spring possessing a reduced diameter, which, during compression and rotation of the spring, will inhibit any large frictional forces from being generated as a result of any contact between the external surface of the helical compression spring and the inner wall of the hollow piston in which it is installed.

Furthermore, the respective dependent claims each more specifically emphasize and set forth the configuration of the reduced diameter helical compression spring portions intermediate the ends thereof, such as the reduced diameter spring portion being formed by a concave configuration of the spring along the axial extent thereof, preferably the center portion between the opposite ends of the spring, thereby avoiding the formation of any sharp edges or corners which would tend to buckle the spring during compression and rotation of the piston drum containing the pistons.

Furthermore, although the use of a single spring is well-known in the technology, which as mentioned above, fulfills Hook's Law in providing improved spring characteristics or rates in comparison with pairs of springs which are in a series grouping or axial alignment, it is the particular novel configuration of the present spring, in effect, the reduced diameter portion, which is provided for by the concave configuration towards the center section of the spring along the axially length thereof, that provides for its unique structural and functional advantages. Moreover, not only does the inventive reduced-diameter spring configuration of the single helical compression spring that is utilized for each respective cylinder bore solve the normally encountered friction force problem, there is also a considerable reduction in structural components, in effect, a reduction in comparison with Jeffrey that employs two springs and a sleeve in each cylinder bore, to the installation of a single helical compression spring in each bore, possessing the novel and advantageous configuration of the present helical compression spring structure.

In view of the foregoing comments and amendments of the claims, which clearly emphasize and set forth the unique configuration of a helical compression spring having novel characteristics in lieu of the dual in-line spring arrangement and sleeve structure set forth in Jeffrey, the claims being presented herein are clearly and unambiguously directed to allowable and patentable subject matter, and the early and favorable reconsideration and allowance of the application by the Examiner is earnestly solicited.

However, in the event that the Examiner has any queries concerning the instantly submitted Amendment, applicant's attorney respectfully requests that he be accorded the courtesy of possibly a telephone conference to discuss any matters in need of attention.

Respectfully submitted,

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